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WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2005ND79B

Title: Effect of Flow Path Processes on the Geochemistry and Quality of Water Discharged along the Seepage Face at Pigeon Point, Sheyenne Delta Aquifer, Ransom County, North Dakota

Project Type: Research

Focus Categories: Groundwater, Hydrogeochemistry, Wetlands

Keywords: groundwater recharge, hydrogeochemistry, wetlands, vadose zone

Start Date: 05/16/2005

End Date: 08/31/2005

Federal Funds: $4,673

Non-Federal Matching Funds: $9,073

Congressional District: At Large

Principal Investigator:
Phil Gerla

Abstract

The large seepage face at Pigeon Point, Ransom County, North Dakota, provides an opportunity to trace the evolution of groundwater geochemistry back to its source as infiltrating precipitation. The land cover within the spring and seep capture zone consists of dunes, native grass pasture, wetland, and irrigated cropland that lie above the phreatic Sheyenne delta aquifer. Previous work revealed that the seepage face shows a wide variation in mineralization and oxidation-reduction conditions, with strikingly more reduced and mineralized water discharging from higher areas indicating a shorter groundwater pathline. We hypothesize that the groundwater quality relates to vadose and shallow phreatic geochemical processes, which are largely controlled by differences in soils and land cover, and that water composition remains generally unchanged along deeper pathlines. To test this, three nests of soil water samplers and well points will be used to sample soil water and groundwater. Samples along pathlines, including seeps and springs at the downgradient end, will be collected twice in contrasting seasons using standard protocol. Electrical conductivity, temperature, and dissolved oxygen will be measured on-site. Analysis for major and minor ions and dissolved organic carbon will be performed at the University of North Dakota Environmental Analytical Research

Laboratory. Results will provide a conceptual model on how groundwater composition evolves within this shallow aquifer flow system. The model will be used to explain the unusual variation of water quality at the seepage face and help predict changes in water quality following alteration of land cover.